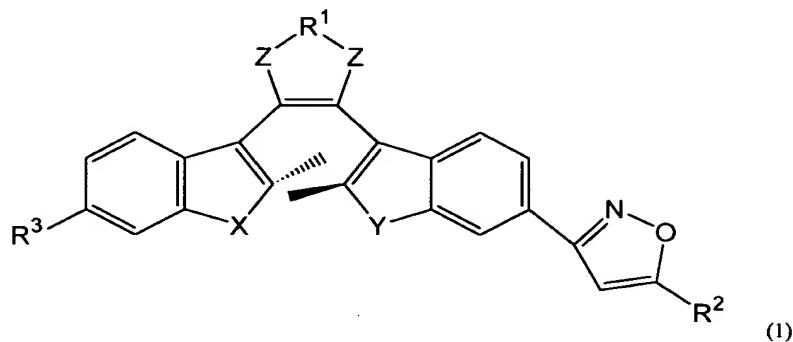


**What is claimed is:**

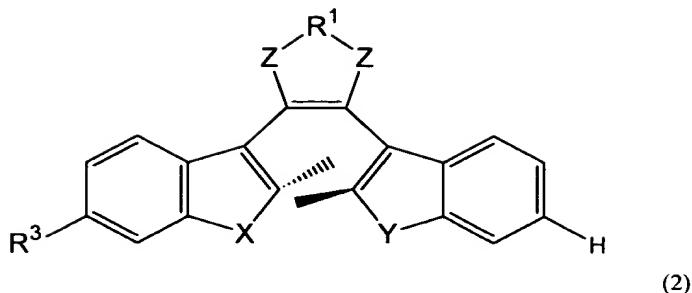
1. A photochromic diarylethene compound having isoxazole group expressed in the following formula (1),



wherein R<sup>1</sup> is a direct bond, O, or C<sub>1</sub>-C<sub>3</sub> alkylene optionally substituted with fluoro; R<sup>2</sup> is a hydrogen atom, (CR<sup>4</sup>H)<sub>n</sub>OH or C<sub>6</sub>(R<sup>5</sup>)<sub>m</sub>H<sub>1</sub>; R<sup>3</sup> is selected from the group consisting of a hydrogen atom, phenylisoxazole, hydroxymethylisoxazole, acetyl, hydroxy, and phenyl; R<sup>4</sup> is C<sub>1</sub>-C<sub>10</sub> alkyl; R<sup>5</sup> is chloro, nitro, bromo, or the same as R<sup>4</sup>; X and Y are independently O, N, or S; Z is methylene optionally substituted with fluoro or carbonyl; and n, m and l are an integer of 1 to 5.

2. A method for preparing said diarylethene compound comprising the steps:

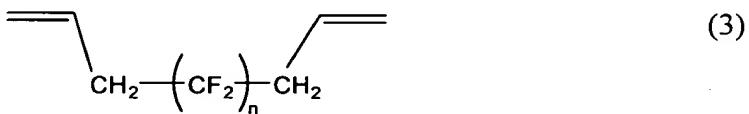
- (i) formylating diarylethene compound of formula (2);
- (ii) reacting the formylated compound with NH<sub>2</sub>OH · HCl and aqueous basic solution in series and reacting with N-chlorosuccinimide (NCS); and
- (iii) reacting with acetylene compound substituted with R<sup>2</sup> in the presence of base catalyst,



wherein  $R^1$  is a direct bond, O or  $C_1$ - $C_3$  alkylene optionally substituted with fluoro;  $R^3$  is selected from the group consisting of a hydrogen atom, phenylisoxazole, hydroxymethylisoxazole, acetyl, hydroxy, and phenyl;  $X$  and  $Y$  are independently O, N, or S; and  $Z$  is methylene optionally substituted with a fluoro atom or carbonyl.

3. A photochromic diarylethene composition comprising 0.1-90wt.% of the compound of claim 1, 10-89.9wt.% of one or more resin selected from the group consisting of polyolefin, polycarbonate, polymethylmethacrylate, polyester, polyvinyl alcohol, polyurethane, and polyimide, and 10-89.9wt.% of one or more solvent.

4. A photochromic diarylethene composition comprising 0.1-90wt.% of the compound of claim 1, 10-99.8wt.% of fluorinated diacrylate monomer of formula (3), 0-80wt.% of monomer or oligomer having unsaturated group, 0.1-10wt.% of initiator of polymerization selected from thermalpolymerizaition initiator or photopolymerizaition initiator, and 0-90wt.% of one or more solvent,



wherein  $n$  is an integer of 0 to 10.

5. The photochromic diarylethene composition according to claim 3, wherein said solvent is selected from the group consisting of acetone, hexane, acetonitrile,

$C_1-C_{10}$  alcohol, dimethylformamide, tetraalkoxysilane, trialkoxysilane, dialkoxy silane, sulfuric acid, hydrochloric acid, organic acid, dimethylsulfoxide, pyridine, N-methylpyrrolidinone (NMP), sulfolane,  $\alpha$ - methylnaphthalene, methoxynaphthalene, chloronaphthalene, diphenylethane, ethylene glycol, quinoline, dichloromethane, dichlorobenzene, dichlorotoluene, propylene carbonate, xylene, methyl ethyl ketone, chloroform, methylene chloride, trichloroethane, trichloroethylene, tetrahydrofuran, 1,4-dioxane and water.

6. The photochromic diarylethene composition according to claim 4, wherein said organic solvent is selected from the group consisting of acetone, hexane, acetonitrile,  $C_1-C_{10}$  alcohol, dimethylformamide, tetraalkoxysilane, trialkoxysilane, dialkoxy silane, sulfuric acid, hydrochloric acid, organic acid, dimethylsulfoxide, pyridine, N-methylpyrrolidinone (NMP), sulfolane,  $\alpha$ - methylnaphthalene, methoxynaphthalene, chloronaphthalene, diphenylethane, ethylene glycol, quinoline, dichloromethane, dichlorobenzene, dichlorotoluene, propylene carbonate, xylene, methyl ethyl ketone, chloroform, methylene chloride, trichloroethane, trichloroethylene, tetrahydrofuran, 1,4-dioxane and water.

7. The photochromic diarylethene composition according to claim 4, wherein said unsaturated monomer is selected from the group consisting of methyl methacrylate, butyl methacrylate, styrene, and  $\alpha$ -methylstyrene.

8. The photochromic diarylethene composition according to claim 4, wherein said polymerization initiator is selected from the group consisting of benzoyl peroxide, 2,2'-azobisisobutyronitrile, and bis(1,1-dimethylethyl)peroxide, 1-hydroxycyclohexyl phenyl ketone, benzophenone, 2-hydroxy-1-[4-hydroxyethoxy]phenyl]-2-methyl-propanone, 2,2-dimethoxy-2-phenylacetophenone, fluorinated diaryltitanocene, and 2,2-bis(hydroxymethyl)propionic acid.

9. A photochromic diarylethene thin film prepared by coating the compound of claim 1 or photochromic thin film composition selected from the compositions of claims 2-6 on a substrate selected from conducting electrode substrate such as aluminum foil, aluminum drum, aluminum plate, platinum, Myler film, copper plate, conducting glass and conducting plastic; or a substrate such as polypropylene, propylene carbonate, polymethylmethacrylate, polyurethane, plastic, and glass.

10. A recording material, photochromic window, indicating element, plastic mirror, photochromic filter, photo switch, photosensitive drum, recording element, solar cell, lens, fiber, or optical element containing the compound selected from the compound of claim 1, and one of said compositions of claims 2-6.

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